

PATENT ABSTRACTS OF JAPAN

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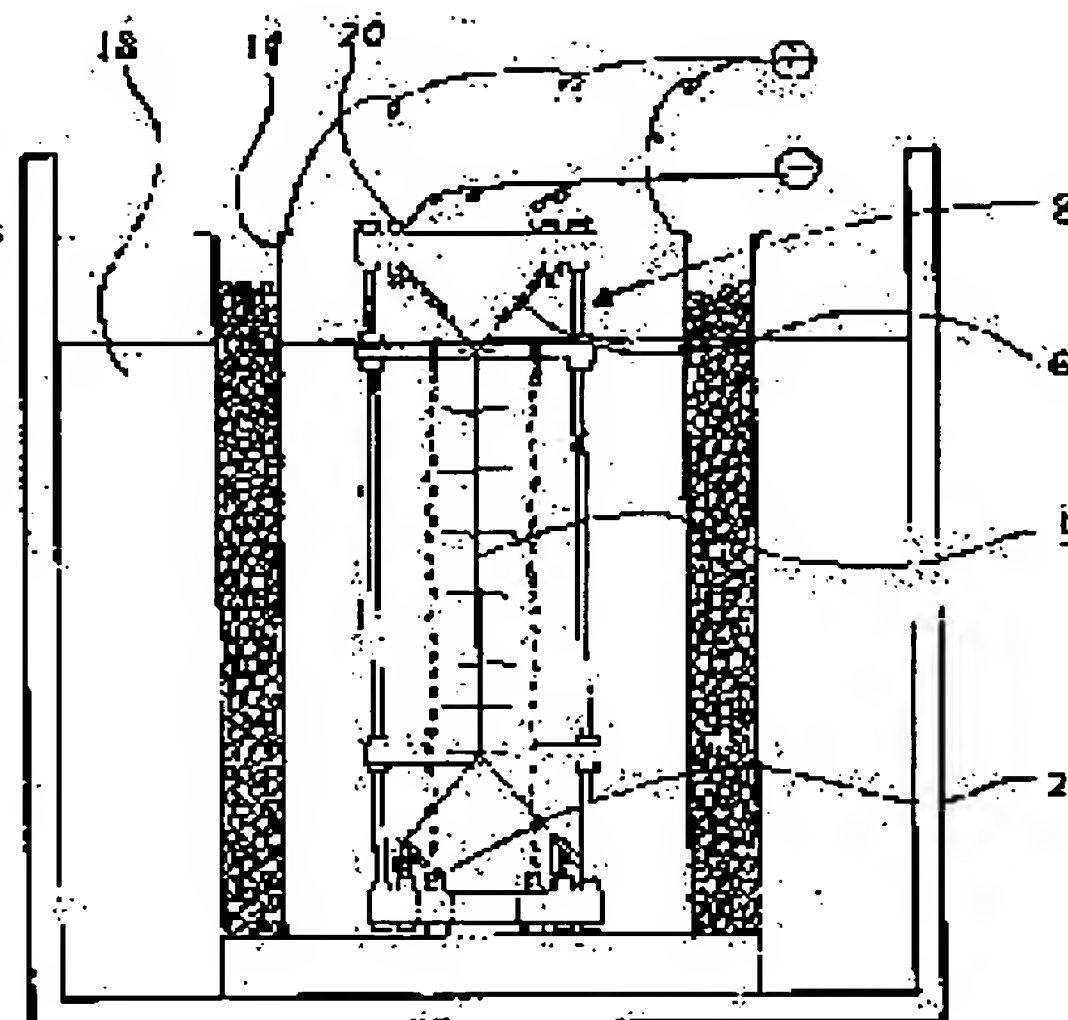
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(54) METHOD FOR MANUFACTURING PARTS FOR OPTICAL FIBER CONNECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To easily and inexpensively clear severe positional precision of lines, to reduce the dispersion of quality, to elongate the effective length of electrocasting as much as possible and to reduce the total manufacturing cost, in a method for manufacturing a ferrule wherein plural number of lines made of metal or plastic or the like are used in a mother mold and finishing is performed after removing the lines by electrocasting.

SOLUTION: The improvement of the positional precision of the lines is facilitated, the cost is reduced and the dispersion of quality is reduced by using plural number of fixing parts 9 in a state where the lines are in contact with each other in order to position the lines of the negative electrode jig for electrocasting.



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CLAIMS

[Claim(s)]

[Claim 1]A manufacturing method of parts for optical connectors characterized by forming two or more holding parts 9 of a line where positioning of a line of the negative pole jig 8 of electrocasting is contacted in the line 5 in a manufacturing method of a ferrule which removes the line 5 after using two or more [of the lines 5, such as metal and a plastic,] for a matrix and electroforming them.

[Claim 2]A manufacturing method of said part for optical connectors according to claim 1 fixing on thread and a tape in the holding part 9 of the line 5.

[Claim 3]A manufacturing method of said part for optical connectors according to claim 1, wherein section pore shape uses a jig which opened holes, such as an ellipse, a triangle, a quadrangle, and a diameter of a hexagon head, for the holding part 9 of the line 5.

[Claim 4]A manufacturing method of said part for optical connectors according to claim 1 using heat-shrinkable tubing for the holding part 9 of the line 5.

[Claim 5]A manufacturing method of said part for optical connectors according to claim 1 using adhesives for immobilization of the line 5.

[Claim 6]A manufacturing method of said part for optical connectors according to claim 1 using a magnetic material for the line 5.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the manufacturing method of optical fiber connector parts.

If it explains in detail, an optical connector doubles correctly the position of the cores which exist at the center of an optical fiber when a section supports through the optical fiber of the thickness of 0.125 mmphi in the pipe of a cylindrical shape with a round shape, aims at connection, and are realized with some parts, but. It is related with the manufacturing method of the parts generally called ferrule which is in the central part and holds an optical fiber.

[0002]

[Description of the Prior Art] Conventionally, the ferrule which is one of the parts for optical connectors is shape as shown, for example in drawing 1 (a) and (b).

That for which construction material used zirconia ceramics occupies the mainstream.

Drawing 1 (a) is the one mind type ferrule 1, the round shape hole 2 about 0.126 mmphi is punched at a center with a thickness [of 2 mm] phi grade, and cylindrical shape about 8 mm in length, and drawing 1 (b) is a double face type thing.

[0003] and in the present commercial scene, although the thing a double face type as shown in drawing 1 (b), or multi-core type beyond it was beginning to be required, the hole carried out size appearance, it is trouble and difficulty difficulty of processing, that skillful advanced work is required for a worker, etc., and there was a serious problem for cost, quality, the amount of burst sizes, etc.

[0004] On the other hand, this invention person has proposed the metal ferrules manufactured with metal, such as nickel, by electrocasting to the matrix in Japanese Patent Application No. No. 375372 [ten to] using the line of metal or a plastic.

[0005] After using two or more [1 or] for a matrix and electroforming lines, such as a metal wire, to this in the patent concerned, have proposed the method of removing a line by whether the line concerned being drawn out, it dissolving, or it extruding, but. In the manufacturing method of a ferrule as shown in drawing 1 (b) which uses 2 or two or more lines beyond it among these methods, Alignment is correctly carried out to the line attachment component 3 of the upper and lower sides as shown in drawing 2, the hole 4 is opened, the two lines 5 are put into this hole, and after the spring 6 has pulled the line 5 as strongly as possible, the method of forming the solder part 7 with a constant interval is proposed.

[0006] If it explains in more detail, when making into a matrix the thing in the state where 2 or two or more lines, such as a metal wire, were pulled strongly and electroforming it, it is very effective in the cost cut of a electrocasting process to lengthen electrocasting effective length if possible and to electroform him, but. If effective electrocasting length is short, will take the reason from one made electrocast products, and its number will decrease, Therefore, from many number of expensive electrocasting jigs being needed, and the space requirement of a electrocasting bath becoming large. The time and effort which many electroforming solutions and electrocasting tubs are needed, and the expense which warming, churning, etc. take in connection with it also becomes remarkably high, and sets a line to a jig, If effective electrocasting length sets to 150 mm what was the effective electrocasting length of 30 mm, for example from it being almost the same as a long thing and a short thing, since it described above, 1/5 or less will be the cost of a electrocasting process.

[0007] From there being a phenomenon in which a line runs by the influence of vibration, such as churning of electroforming solution, etc. in the midst of electrocasting, and the position of an exact line is not acquired, if effective electrocasting length tends to be lengthened and it is going to electroform it. As shown in the negative pole jig 8 of drawing 2, where the line 5 is pulled as strongly as possible, the solder part 7 was formed with the constant interval, and the motion of a line was prevented, but there were the following problems.

[0008] The process of providing a process, the solder part 7, etc. which carry out alignment to the up-and-down line attachment component 3 correctly, and open the two holes 4 with a constant interval, and preventing a motion of a line, From very as severe accuracy of position as **several microns being required, it is very difficult, and the variation in the position of a hole is large in quality, and there are problems, like the cost of the jig of the negative pole becomes remarkably high, and it had become a big neck of fertilization.

[0009]

[Problem(s) to be Solved by the Invention] This invention uses two or more lines beyond 2, such as a metal wire, or it for a matrix in view of the above, In the manufacturing method of the ferrule of the multi-core type machined

after removing the line concerned after electrocasting, Very as severe accuracy of position as **several microns required of the jig of the negative pole is cleared easily, variation in quality is lessened, and it makes it possible to lengthen effective electrocasting length as much as possible, and is making into the technical problem to lower the expense which electrocasting takes.

[0010]

[Means for Solving the Problem]In order to solve said technical problem, a method of making into a matrix what fixed two or more lines in the state where it contacted as shown in drawing 3, and electroforming it was used for this invention.

[0011]When it explains in more detail, drawing 3 is an example of a 2 heart type negative pole jig concerning this invention, but. The superior lamella 10 and the inferior lamella 11 are fixed with the four supports 12, the superior lamella 10 and the inferior lamella 11 use electrical insulation materials, such as polyvinyl chloride resin, polyamide resin, polyacetal resin, and polyethylene resin, and metal or plastics, such as stainless steel and titanium, are used for the support 12. It fixes with a screw and the superior lamella 10, the inferior lamella 11, and the support 12 fix the spring 6 made from stainless steel to two right and left of the superior lamella 10 with a stainless steel screw etc. The clip 13 made from a plastic is fixed with screws to two places of right and left of a position of the superior lamella 10 and an object by the inferior lamella 11, and it has composition that the circular hole 14 for air jet holes was punched at four places. The line 5 made from stainless steel is first fixed to the hook part 15 of the spring 6 made from stainless steel, Bind with the thread 16, such as nylon thinner after changing into the state where it was inserted and pulled by the clip 13 and the two lines 5 became straight, pulling the line 5 and lengthening the spring 6, and the holding part 9 is formed, What is necessary is to carry out positioning which prevents a twist of the line 5 in the state where it contacted weakly to the line position decision bar 17 provided so that it might pass along near the center of a jig in the middle of a negative pole jig, and just to electroform.

[0012]In drawing 3, although the holding part 9 by the thread 16 is formed in eight places, Since it may separate by vibration of churning etc. and may become poor as the line 5 is electrocasting, when an interval of the holding part 9 is large, although selected suitably, it is more desirable to narrow an interval as much as possible, but a position of the holding part 9 has some which form the holding part 9 in two places within the limits of this invention.

[0013]Using a magnetic material for the line 5 for the purpose of preventing the line 5 from separating and a method of filling up a crevice between two or more lines with an instantaneous adhesive may be adopted.

[0014]Although a method of binding with the thread 16 to the holding part 9 is adopted in drawing 3, a method of inserting in rings which twist a tape and are fixed, such as a method and a product made of rubber, a method of using adhesives, a method of using heat-shrinkable tubing, a method of letting it pass to a jig which opened a hole as shown in drawing 4, etc. may be adopted. In drawing 4, (a) is a double face type in a hole of an ellipse form, and (b) is a 3 heart type in a triangle, (c) is a 4 heart type in a regular tetragon, (d) is a five-centroids type in a rectangle, (e) is a 6 heart type in a rectangle, (f) is a 7 heart type in a hexagon, and (g) is a 4 heart type in a rectangle.

[0015]An electroforming device is as being shown in the schematic diagram 4, and comprises the electroforming solution 18, the positive electrode 19, the negative pole jig 8, the compressed-air-agitation nozzle 21, the spring 6, the negative terminal 20, and the line 5.

[0016]Although the electroforming solution 18 is the construction material of an electroforming metal made into the purpose and it differs, respectively, For example, nickel or its alloy, iron or its alloy, copper or its alloy, cobalt, or its alloy, Electroforming metals, such as a tungsten alloy and particle distribution metal, are employable, Nickel amiosulfonate, nickel chloride, nickel sulfate, the first iron of sulfamic acid, The first iron of the Howe fluoridation, a pyrophoric acid trunk, copper sulfate, the Howe copper fluoride, cay copper fluoride, Solution which uses solution, such as titanium copper fluoride, alkanol copper sulfonate, cobalt sulfate, and sodium tungstate, as the main ingredients, Or liquid which made these liquid distribute impalpable powder, such as silicon carbide, tungsten carbide, boron carbide, zirconium oxide, CHITSU-sized silicon, alumina, and a diamond, is used. A bath which uses nickel amiosulfonate as the main ingredients especially among these is suitable in respect of the diversity of physical properties, such as the ease of doing of electrocasting, and hardness, chemical stability, the ease of welding, etc. And high rate filtration of the electroforming solution is carried out with a filter with a filtering accuracy of about 0.1-5 micrometers, Warm, and carry out a temperature control to the appropriate temperature range of about **3 **, and sometimes, It is desirable to carry out activated carbon treatment, to use as the anode the iron corrugated panels which removed and carried out the nickel plate of the organic impurities, to use carbon as the negative pole, to energize by low current density about 0.2 A/dm^2 , and to remove metal impurities, such as copper.

[0017]The positive electrode 19 changes with target electroforming metals, and is selected from nickel, iron, copper, cobalt, etc., and a tabular and spherical thing is suitably used for it. What is necessary is just to use it, putting into a basket made from titanium and covering with a cloth bag made from polyester, when using a spherical thing. And composition and intermediary **** which arranged the four positive electrodes 19 focusing on the line 5.

[0018]And it agitates by blowing off a little air from a hole of the compressed-air-agitation nozzle 21. However, this churning is not limited to air stirring, but can adopt churning of a propeller, an ultrasonic wave, super-vibration, etc. as others.

[0019]Selection use of the line 5 is suitably carried out from plastic lines, such as metal wires, such as iron or its alloy, aluminum or its alloy, copper, or its alloy, a thing which carried out a thin solder plate on this metal wire and nylon, and polyester. Among these, in the case of a plastic line, electroless deposition, such as nickel and silver, is needed for the surface for conductive grant. Thickness, deviation from circular form, and accuracy high to linearity

are required, and the line 5 should just adjust by extrusion by a dice, a method by wire drawing, etc.

[0020]Electrocasting carries out a direct current with current density about $4 - 8 \text{ A/dm}^2$ for about 10 to 20 hours, and after it is cylindrical, taking out from a electrocasting tub after making it grow up to be the thickness about 1.0–2.5 mmphi, and rinsing, it is made to dry it, although electrocasting will be carried out with the above devices.

[0021]Although it is determined whether a kind of line 5 to choose draws out the line 5 which exists at the center of electrocast products, it extrudes, or it dissolves with medicine, what is generally hard to dissolve in medicine, and draws out what has high tensile strength, or uses extrusion, and it is easy to dissolve in medicine uses the dissolution. For example, in the case of iron or its alloy, the line 5 should just be drawn out, after carrying out releasing treatment of the line 5, electroforming it and making it cylindrical. What is necessary is just to draw out in a similar way in the case of the above-mentioned plastic line which carried out electroless deposition. Especially among these, stainless lines which are iron alloys were desirable, and, experimentally, were able to draw out to a length of about 50–100 mm by 0.126 mmphi.

[0022]In the case of the lines 5, such as aluminum or its alloy, copper, or its alloy, since it is easy to dissolve in acid or an alkaline aqueous solution, removal by the dissolution is mainly used. From especially aluminum or its alloy dissolving in a strong-alkali-water solution which hardly affects an electroforming metal easily, it is desirable and specifically, Strong-alkali-water solutions, such as about [10–30 w/v%] sodium hydroxide and a potassium hydrate, can be used, and dissolution removal can be easily carried out at about 100°C .

[0023]What is necessary is just to carry out finish by NC machining, a centerless process, etc. in machining, after drawing out the line 5 in the case of drawing. What is necessary is to dissolve the line 5, after electroforming with one stick in the dissolution and cutting into the length of an outline, and just to adopt a method of finishing by NC machining etc. or dissolving the line 5 after machining, etc., after checking that a hole has penetrated.

[0024]

[Function]According to the method of this invention, two or more lines beyond 2, such as a metal wire, or it are used for a matrix, By having adopted the method of fixing a line to the negative pole jig of electrocasting in the state where it contacted, in the manufacturing method of the ferrule machined after removing the line concerned after electrocasting, It makes it possible to clear easily and cheaply very as severe accuracy of position as \sim several microns required of a jig, and to lessen variation in quality, and to lengthen effective electrocasting length, and it becomes possible to lower the whole production cost remarkably.

[0025]

[Example]If the example of this invention is described below, SUS304 line of 0.127 mmphi with a circular section will be prepared, After being immersed in the solution of the knickerbockers non tuck A by Nihon Kagaku Sangyo Co., Ltd. of marketing as shown in drawing 5, after setting to the state where it pulled to the jig for electrocasting strongly for the elasticity of a spring and rinsing, and B mixed liquor for 10 minutes and carrying out releasing treatment to it at ordinary temperature, it rinsed well. The four anodes which put the nickel ball in the net made from titanium which put nickel amiosulfonate into the bag made from polyester on the other hand at the electrocasting bath used as the main ingredients were put into four corners focusing on the line, and the tub which carried out high rate filtration with the filtering accuracy of 1 micrometer, and warmed the electrocasting bath at 50°C was prepared. And it set, as shown in drawing 5, and the line was used as the negative pole, nickel was used as the anode, electrocasting was carried out with the current density about $4 - 6 \text{ A/dm}^2$ on the 1st, and nickel electrocast products with a length of about 200 mm which has the holding part 9 at intervals of about 15 mm on the way with the thickness of about 2.4 mmphi on an average were obtained. When the line was drawn out from these electrocast products, it was able to draw out easily. Next, it was processed to the thickness of 2.00 mm, and 8.00 mm in length with NC automatic processing machine, a centerless process machine, etc., and was considered as the finished product. What was manufactured in this way was a satisfactory product.

[0026]

[Effect of the Invention]This invention does the following effects so by the method shown above. By having used two or more lines beyond 2, such as a metal wire, or it for the matrix, and having adopted the method of forming the holding part 9 in the manufacturing method of the ferrule which removes the line concerned after electrocasting where positioning of the line of a negative pole jig is contacted in a line, The accuracy of position of a very as severe line as \sim several microns required of the matrix of the jig of the negative pole is cleared easily and very cheaply, and variation in quality can be lessened.

[0027]Since it becomes possible to lengthen effective electrocasting length as much as possible by forming the holding part 9 in two or more places, productivity can improve remarkably and can lower a production cost remarkably.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is the sectional view and side view of the parts for optical connectors concerning a conventional method.

[Drawing 2]It is a side view showing one example in double face type [of the negative pole jig concerning a conventional method].

[Drawing 3]It is a side view showing one example of the double face type negative pole jig concerning this invention.

[Drawing 4]It is a figure showing one example of the sectional shape of a hole at the time of using the jig which opened the hole for the holding part of the negative pole jig concerning this invention.

[Drawing 5]It is an outline lineblock diagram showing one example of the electrocasting manufacturing installation concerning this invention.

[Description of Notations]

1 Ferrule Two Round shape hole

3 Line attachment component Four Hole

5 Line Six Spring

7 Solder part Eight Negative pole jig

9 Holding part Ten Superior lamella

11 Inferior lamella 12 Support

13 Clip 14 Circular hole

15 Hook part 16 Thread

17 Line position decision bar 18 Electroforming solution

19 Positive electrode 20 negative terminals

21 Compressed-air-agitation nozzle

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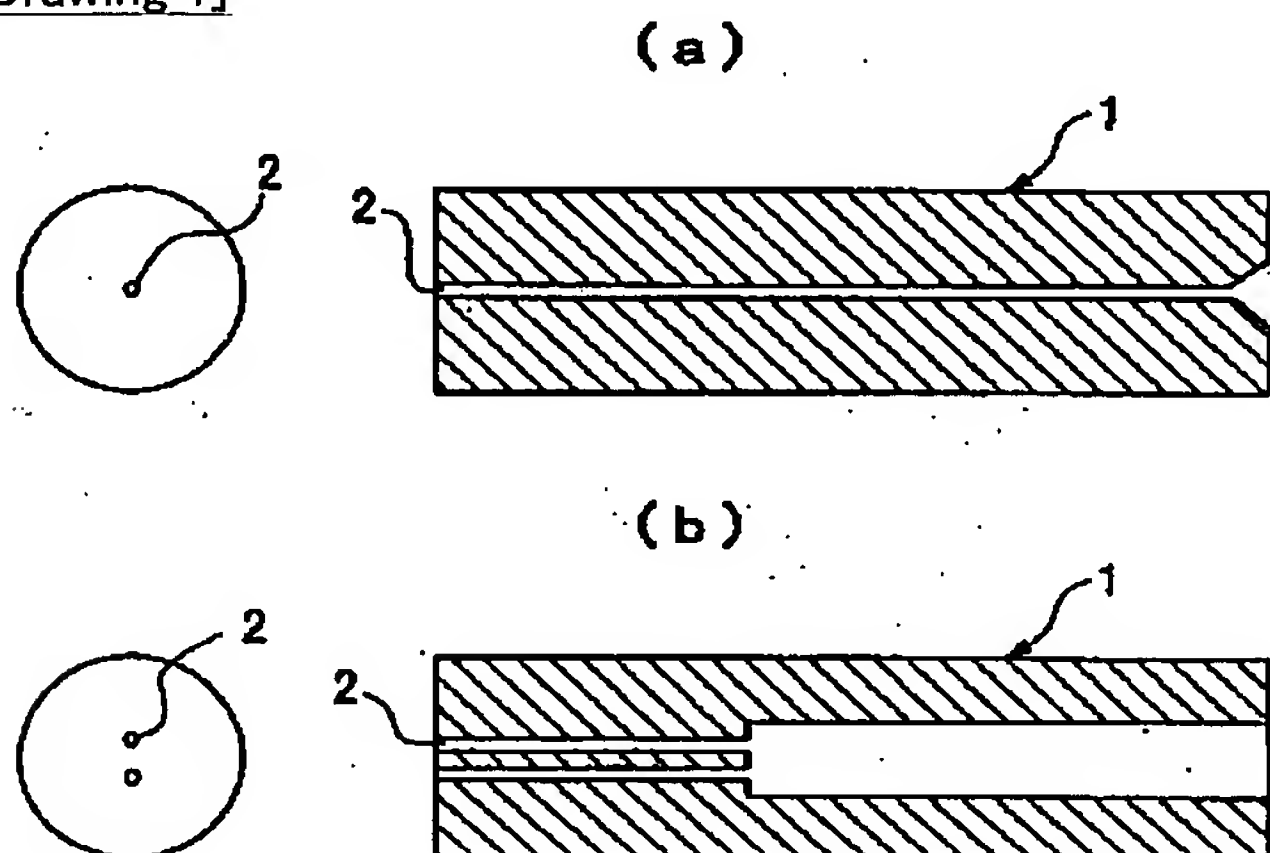
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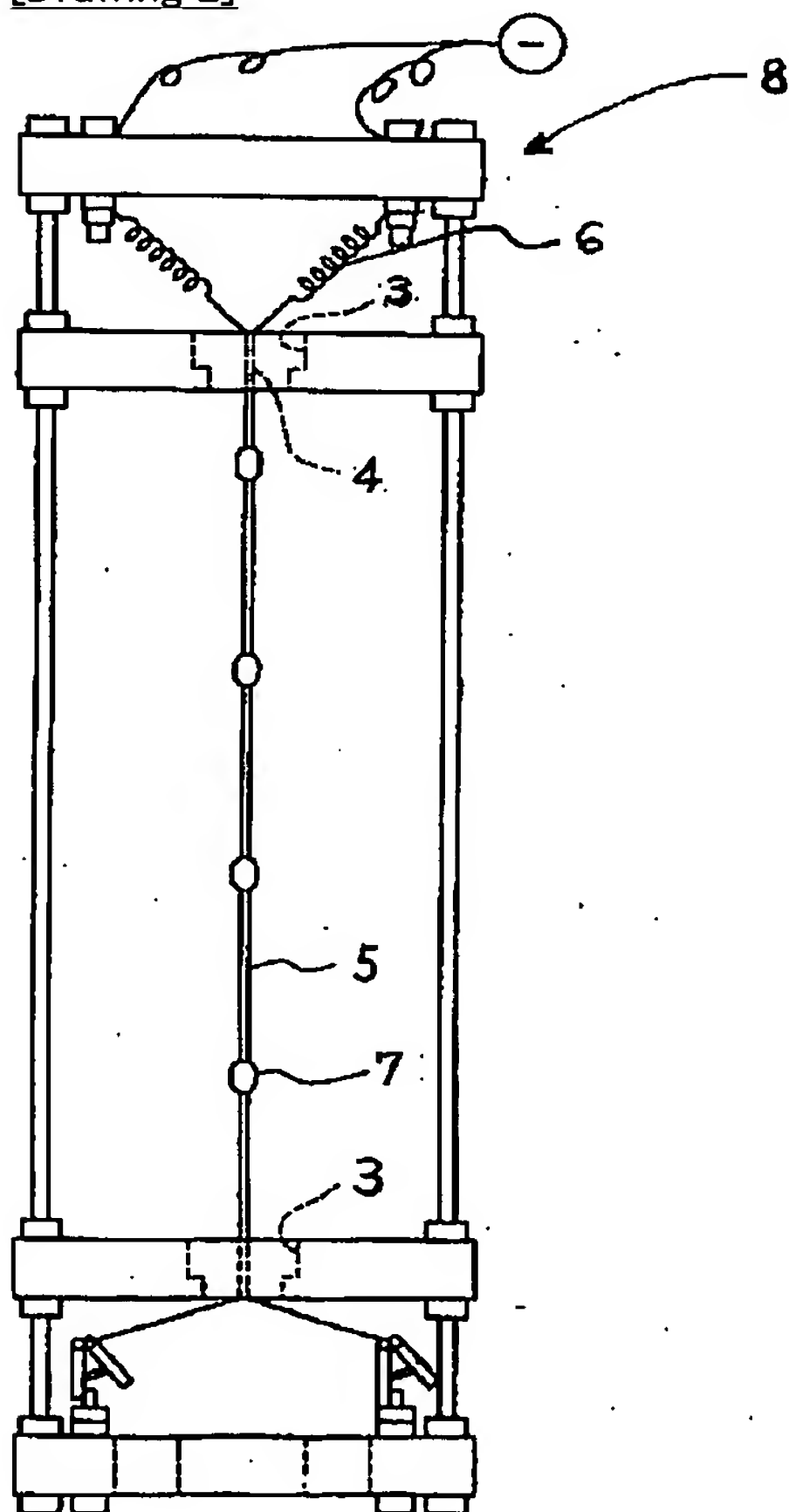
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DRAWINGS

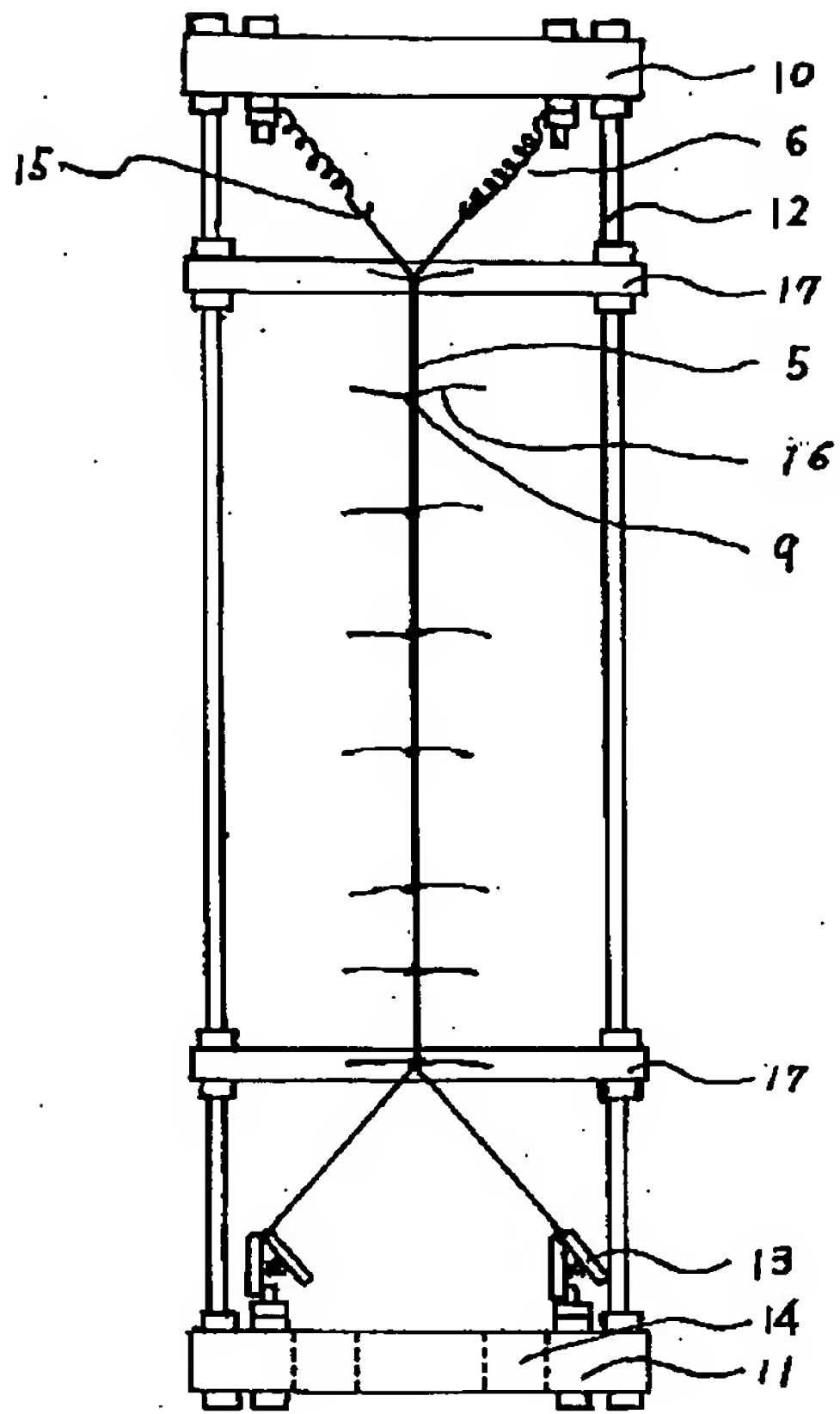
[Drawing 1]



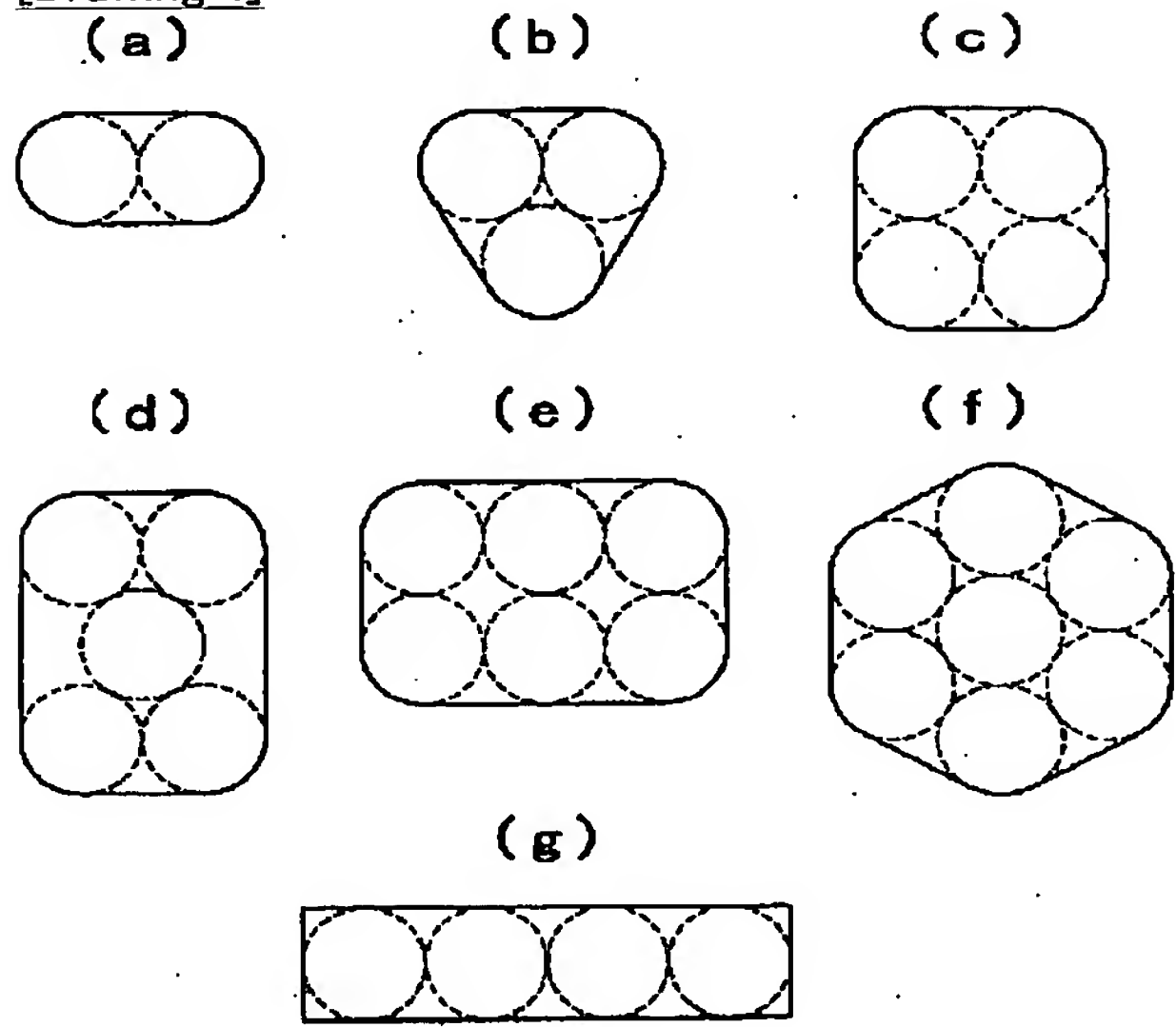
[Drawing 2]



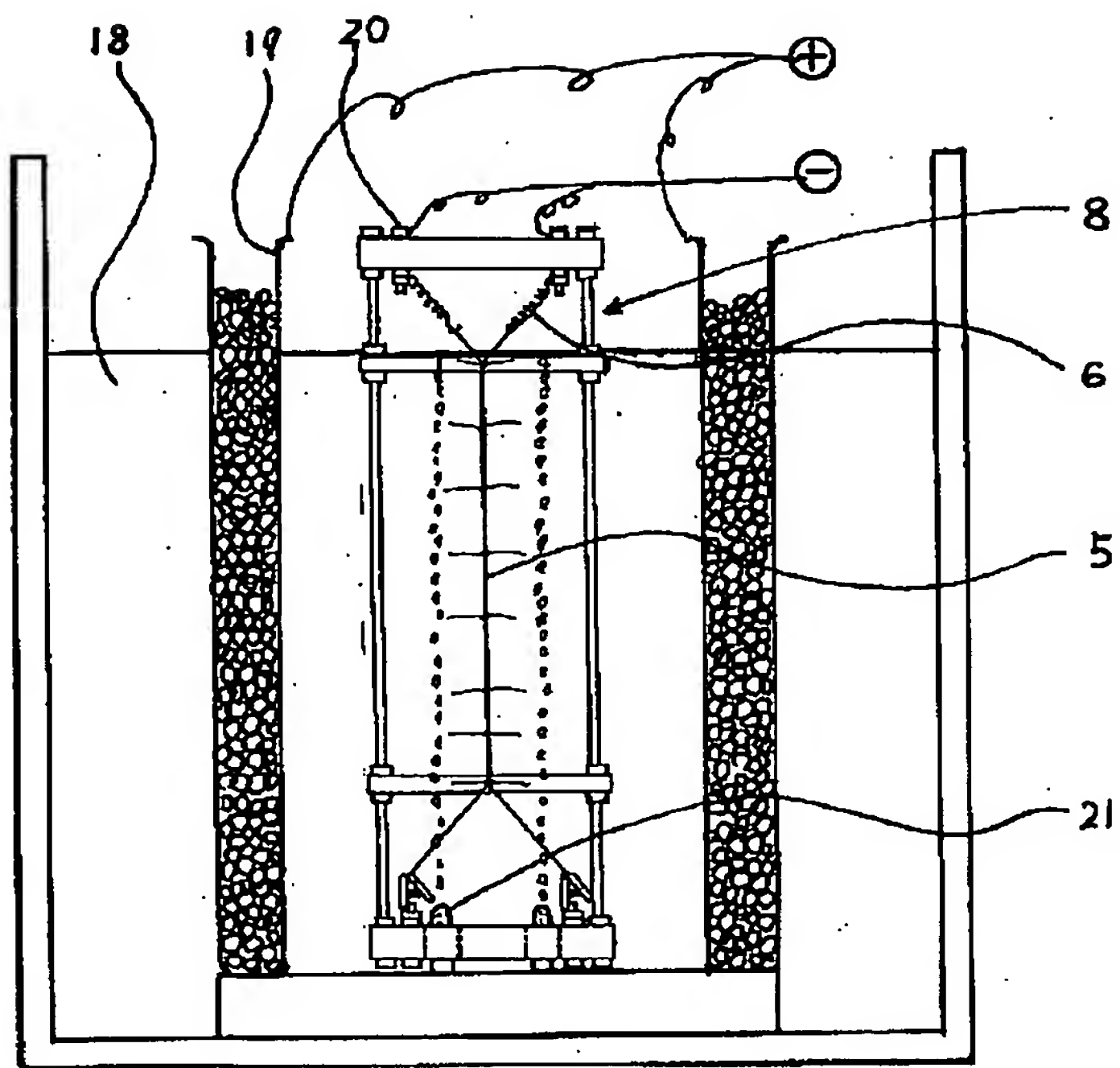
[Drawing 3]



[Drawing 4]



[Drawing 5]



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(54) 【発明の名称】 光ファイバコネクタ用部品の製造方法

(57) 【要約】 (修正有)

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